

**N O R T H S O U T H U N I V E R S I T Y**

Centre of Excellence in Higher Education **DEPARTMENT OF MATHEMATICS AND PHYSICS**[*School of Engineering and Physical Sciences*](http://www.northsouth.edu/faculty-members/seas/)

**Course outline: Fall 2025**

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| **Course Title** | **Calculus and Analytical Geometry III** (3 Credits) |
| **Course Code** | **MAT 250** |
| **Section:** |  |

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| **Instructor Name** |  |
| **Email Address** |  |
| **Office Room** |  |
| **Office Hours** |  |

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| **Prerequisites** | MAT 130 |
| **Course Objectives** | 1. To demonstrate the function of several variables and plotting 3D figures. 2. To teach the concept of partial derivatives and their applications. 3. To develop the ability of multiple integrations in different coordinate systems. 4. To analyze the vector calculus and its physical significance. |
| **Course Learning Outcomes** | Upon the successful completion of this course, a student will be able to:  **(CO-1)**Classify the difference between single and several variables functions and limits as well as plotting 3D figures.  **(CO-2)**Evaluate the partial derivatives for several variables functions and distinguish ordinary and partial derivatives.  **(CO-3)**Apply multiple integration techniques to find the area and volume of the different model geometries.  **(CO-4)**Demonstrate their understanding of vector calculus and vector algebra.  **(CO-5)**Apply line and surface integrals to evaluate the work done and the corresponding flux. |

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| **Text Book** | |
| **Author** | **Howard Anton, IRL Bivens, and Stephen Davis** |
| **Title** | **Calculus: Early Transcendentals** |
| **Edition & Year** | 10th Edition, 2013 |
| **Publisher** | John Wiley & Sons, Inc |

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| Mapping of Course Outcomes |

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| **#** | **Course Outcomes (CO)** | **Bloom’s taxonomy**  **domain/level**  *(***C***: Cognitive*  **P***: Psychomotor*  **A***:* *Affective)* | **Delivery methods**  **and activities** | **Assessment**  **tools** |
| **CO-1** | Classify the difference between single and several variables functions and limits as well as plotting 3D figures. | **C1, C2, C3** | |  | | --- | | Lecture  Discussion | | |  | | --- | | Quiz, Assignment | |
| **CO-2** | Evaluate the partial derivatives for several variables functions and distinguish ordinary and partial derivatives. | **C3, C4, P2** | |  | | --- | | Lecture, in-class group discussion, | | Concept clarification,   |  | | --- | | Midterm exam, Assignment | |
| **CO-3** | Apply multiple integration techniques to find area and volume of the different model geometries. | **C2, C3, P2** | Lecture,   |  | | --- | | Discussion | | Class work,  Quiz, Assignment, Final Exam |
| **CO-4** | Demonstrate their understanding of vector calculus and vector algebra. | **C2, P2** | Lecture,  Discussion | Concept, Demonstration,  Quiz, Assignment, Final Exam |
| **CO-5** | Apply line and surface integrals to evaluate the work done and the corresponding flux. | **C2, C3, C4, P2** | Lecture  Demonstration | Assignment, Final Exam |

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| **Assessment Strategy** | |  | **Grading Policy\*** | | |
| **Grading tool** | **Percentages** (%) | **Numerical Scores** | **Letter Grade** | **Grade points** |
| Attendance | 05% | 93 and above | A Excellent | 4.0 |
| Assignments (Average of 2) **\*** | 10% | 90 - 92 | A- | 3.7 |
| Quizzes (Best 2 out of 4)**\*\*** | 20% | 83 - 86 | B Good | 3.0 |
| Midterm | 30% | 83 - 86 | B Good | 3.0 |
| Final Exam | 35% | 80 - 82 | B- | 2.7 |
| **Total** | **100**% | 77 - 79 | C+ | 2.3 |
| \*Assignment 01 from the Mid-term syllabus and Assignment 02 from the Final Term syllabus.  \*\* In the count of Best 2, one from the mid-term and the other from the final term. | | 73 - 76 | C Average | 2.0 |
| 70 - 72 | C- | 1.7 |
| 67 - 69 | D+ | 1.3 |
| 60 - 66 | D Poor | 1.0 |

\*Please Refer to the NSU Student Handbook, Section: “Grading Policy”.

**Course Schedule:**

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| **Lecture** | **Topics** | **Learning Activities** | **Assessment tools** | **Learning Outcome** |
| **1-2**  **(13.1)** | Functions of two variables: drawing of the natural domain in -plane and 3D graph plotting | Lecture | Discussions  Quiz-1 | CO-1 |
| **3**  **(13.2)** | Limits and Continuity | Lecture  Assignment-01 | Quiz-1 | CO-1 |
| **4**  **(13.3)** | Partial Derivatives: 1st order derivatives and their physical significance | Lecture  Group Discussion | Discussions  Quiz-2  Mid-term | CO-1 |
| **5**  **(13.3)** | Partial Derivatives: 2nd and mixed order derivatives and their application | Lecture  Discussion | Quiz-2 | CO-1 |
| **6**  **(13.4&13.5)** | Differentiability and  Chain Rule | Lecture | Mid-term | CO-1 |
| **7**  **(13.6)** | Directional Derivatives | Lecture  Assignment-01 | Mid-term | CO-1 |
| **8**  **(13.7)** | Tangent planes and  normal lines | Lecture | Mid-term | CO-1 |
| **9**  **(13.8)** | Maxima and minima of functions of two variables | Discussion  Lecture  Assignment-01 | Mid-term | CO-2 |
| **10**  **(14.1)** | Double Integrals over rectangular regions | Lecture  Assignment-01 | Mid-term | CO-2 |
| **11-12**  **(14.2)** | Double Integrals over non-rectangular regions | Lecture | Mid-term | CO-1 |
| **13** | **Mid-Term Exam** | | | |
| **14**  **(14.3)** | Double Integrals in Polar Coordinates | Lecture | Quiz 3  Final Exam | CO-4 |
| **15**  **(14.5)** | Triple Integrals in Cartesian Coordinates | Lecture  Assignment-02 | Quiz 3  Final Exam | CO-4 |
| **16-17**  **(14.7)** | Change of variables in Multiple Integrals; Jacobian | Lecture  Assignment-02 | Quiz 4  Final Exam | CO-3 |
| **18**  **(11.8, 14.6)** | Triple Integrals in Cylindrical and Spherical Coordinates | Lecture  Assignment-02 | Quiz 4  Final Exam | CO-3  CO-2 |
| **19**  **(15.1)** | Vector fields | Lecture  Assignment-02 | Final Exam | CO-5 |
| **20**  **(15.2)** | Line integrals: for scalar functions and vector fields | Lecture  Assignment-02 | Final Exam | CO-5 |
| **21**  **(15.4)** | Green’s Theorem | Lecture  Assignment-02 | Final Exam | CO-5 |
| **22**  **(15.5)** | Surface Integrals: for scalar functions and vector fields | Lecture Assignment-02 | Final exam | CO-3 |
| **23**  **(15.7)** | Divergence theorem | Lecture Assignment-02 | Final exam | CO-3 |
| **24**  **(15.8)** | Stokes' theorem: (verification and evaluation of line integral) | Lecture, Presenting,  Explaining,  Demonstrating | Final exam  **Formative assessment** |  |
| **Final Exam** | | | | |

**Rules and regulations:**

1. There is **no scope to retake a quiz**. In case of a Mid-term or Final exam, exceptional cases (unfortunate physical inability, accidents, serious illness) may be considered conditionally (with a **penalty of 20% reduced marks**) with proper justification.
2. Three consecutive absences need an official clarification.
3. A student having attendance less than 60% of the total classes will not be allowed to sit for the **Final Exam**.

**\*\* FOUR quizzes will be taken.**

**\*\*\* Two assignments will be taken.**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\* No Make-Up Exam \*\*\*\*\*\*\*\*\*\*\*\*\*\***